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UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 578

OFFICE OF THE SECRETARY

Contribution from the Office of Farm Management
W. J. SPILLMAN, Chief

Washington, D. C. ▼ February 9, 1918

A STUDY OF HAYMAKING CREWS AND LABOR COSTS

By

H. B. McCLURE, Agriculturist

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Hand Loading	4	Conclusion	50

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In considering methods of making hay, the following questions arise: What is the best time of day to start mowing hay? How many mowers shall be used, and how many acres is it best to cut each day? How long must the hay lie in the swath before being raked? If a side-delivery rake is used, what advantage has it over the sulky rake? How many men are needed to haul in hay from the field, and is it more economical with a given acreage to use a hay loader than to load by hand? How many men are needed for storing hay in the barn or to work on the stack?

These and similar questions are of importance to American farmers in general, since the production of hay is a more or less important farm enterprise in most sections of the country, and since the labor cost, the largest item of expense in hay production, is largely made up of the cost of haymaking. It was to throw light on such questions that this study of the common practices of hay growers was made. Over 500 farms, in different hay-growing districts, were visited, and figures were obtained covering haying operations for timothy, timothy and clover, alfalfa, and prairie hay. (See fig. 1.)

Some farmers, when asked to describe the method used in making hay, will reply: "Oh, it is very simple. I just cut the hay down, rake it up, and put it in the barn or stack." Such farmers, though having a very indefinite method, nevertheless can give the number of

acres cut per day with a mower and other information regarding a normal day's work for various haying operations. This information, while of value in finding out the cost of making hay for the locality, is of little value in studying the methods of making hay and comparing their efficiency.

SCOPE OF BULLETIN.

This bulletin is not intended to show the cost of making hay in any particular locality or section, but rather to show the effects of different methods of distribution of labor in the crew, for the purpose of

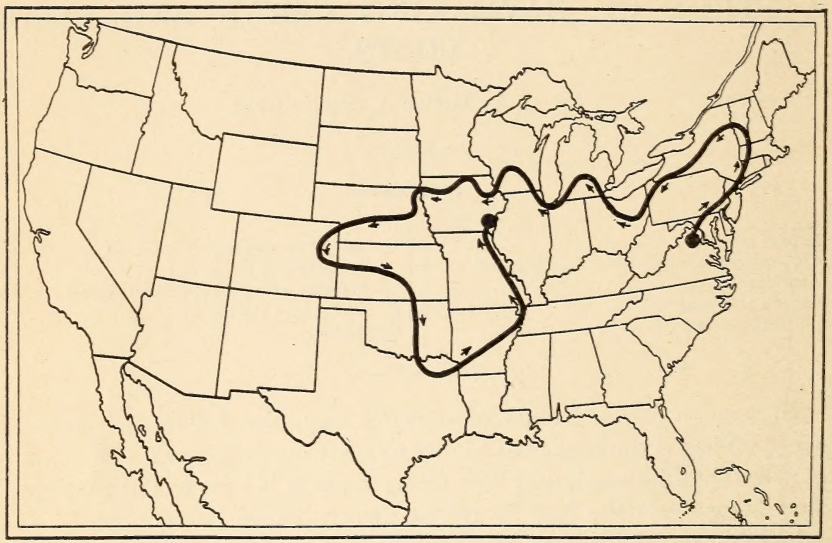


FIG. 1.—Route covered in making this study.

impressing upon the hay grower the importance of working out and using a detailed system that will be most applicable to his individual farm.

In order to assist the hay grower to devise such a method, a few selected methods are described in detail. These illustrate the four general systems in use in making hay. It is not necessary or possible, in this brief survey, to go into the details of the almost infinite variety of hay-making methods used for different kinds of hay under varying yields, sizes of crews, and kinds and extent of machinery used.

The methods used as illustrations are, for the most part, common in their localities, represent small, medium, and large-sized crews, and, as a rule, the best practice in vogue. They are presented in order of increasing size of crews. That the grower may be able to compare the cost and efficiency of the method he is using with those described, a uniform rate of 20 cents per hour for man labor and 10 cents per hour for horse labor has been used. These rates vary somewhat in

actual practice, though that for man labor will be found to be fairly accurate for the hay-growing section as a whole.

EXPLANATION OF SYMBOLS USED IN WORK CHARTS.

In order to compare one method of haying with another, it is necessary for the reader to have some way of fixing in mind easily and quickly the different operations of the crew. Straight bars are used often in work charts to show variations in the seasonable distribution of labor, etc., but while this method is effective within certain limits, it is not applicable in this instance, since, if straight bars were used for the many different operations of haymaking, the chart would at once become confusing and leave but little impression on the mind. For these reasons, symbols have been used which are at once simple and suggestive of the operations they represent. These symbols are used on the charts so that the reader can see at a glance the time each operation starts and stops, the number of men, horses, and machines used, and the time lost in each operation.

For example, the symbol representing mowing is m; that representing raking, r. Thus the first letter of the name of each operation represents that operation on the labor chart. (See work chart 1.) These letters are repeated, extending horizontally, to indicate the lapse of time occupied by the operation. Roman capitals (A, B, C, etc.) are used to designate individual men of the crew, and small Roman letters (a, b, c, etc.) to designate individual two-horse teams. Boys are indicated by capital letters in italics (*A*, *B*, *C*, etc.), and single horses used for raking, etc., by small italics (*a*, *b*, *c*, etc.). Where the same individual takes part in two different operations during the same hours, such as pitching in the field and unloading at the barn, the symbol used to designate this individual is inclosed in parentheses opposite the second operation.

If A and team (a) mow in the forenoon and rake in the afternoon, they are designated by the same letters throughout the day. If any man or team works in the forenoon, but not in the afternoon, the letters used for the man or team in the morning are not given to other men or teams in the afternoon. Thus, the total number of men and teams used during the day can be seen at a glance.

In using the following work charts to determine the method best adapted to his own needs, the farmer always should bear in mind these important factors:

(1) The average number of days available for haymaking in his locality.
(2) The number of acres or tons to be handled daily.
(3) The number of men and horses available for the work.
(4) The type of machinery to be used.

Under each system of making hay the methods have been arranged according to size of crew, the smallest crew first.

CREW CAPACITY.

Apparent discrepancies will be noted in the haying operations, such as amount mowed, raked, pitched, etc., per hour. Variation in the amount mowed is caused by difference in cut of mowers, in yield and character of the hay, and in speed of the mower team. The amount of hay pitched on by hand varies considerably with the ability of the pitcher. The length of haul to barn also makes considerable difference in the amount done per day.

Most of the methods described are in more or less common use in certain localities, but some of the systems, where the labor per ton is rather low, are those used by isolated farmers who have worked out the best methods for their respective conditions.

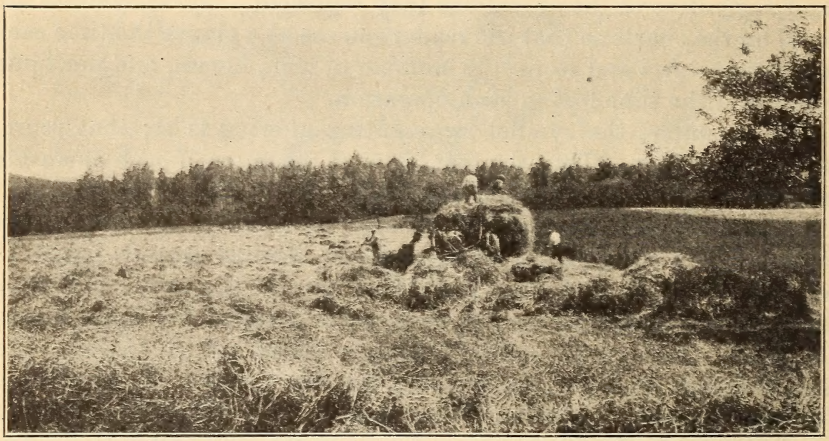


FIG. 2.—Loading wagon with hand forks. This calls for irksome man labor and is the most expensive method of getting hay on the wagon. Economical for small acreage only.

SYSTEMS OF MAKING HAY.

Haymaking may be divided into four general systems, as follows: (1) Wagon loaded by hand and unloaded with horse fork into barn; (2) wagon loaded by hay loader and unloaded with horse fork at barn; (3) hay put into stack with push rakes and stacker; (4) hay baled from the windrow with horse or power press.

System 1.—Hand Loading.

System 1, in which the wagon is loaded by hand forks, is the oldest system, and is used extensively and almost exclusively in the eastern part of the tame hay area. It requires but little outlay for machinery and is best adapted to farms having a small acreage of hay. It is doubtful if it would pay to buy hay loaders for many such small farms, even where the meadows are not too hilly. When hay is cured in the cock it is necessary to use this system. (See fig. 2.)

The three-man crew is most commonly used for acreages up to 30 acres. For a larger acreage up to 60, the five-man or six-man crew is generally used.

METHOD 1.

Method 1 can be recommended only for cases in which a small acreage of legume hay is grown. The man who used this method grew sugar beets as the principal crop, and the haying interfered little with the necessary work required in the beet field. In this system, one man works nearly all the first day in the hay field, and the next day two men work in the morning only. If this system is used, the hay should all be made in a week or ten days, in order to

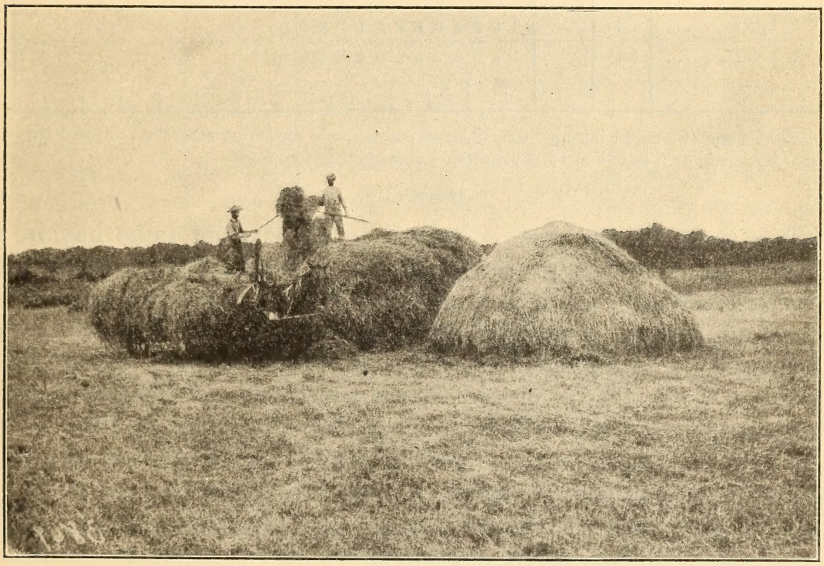


FIG. 3.—Pitching hay on to the stack by hand. This is a slow and costly method of unloading hay and should be used only when the acreage is small.

get the hay all made before it becomes too mature. The method is not to be recommended in sections subject to frequent rainfall. (See fig. 3.)

To facilitate interpretation of the work charts, the first one will be described here in detail. A here represents the man and a his team, which draws the mower in the forenoon and the sulky rake in the afternoon of the first day. The chart shows that the mower runs from 8 o'clock in the morning until noon. In the afternoon A, with his team a, rakes from 3.30 until 6 p. m. B does no work at haying the first day, and he and his team b are available for other work, such, for instance, as cultivating corn. The second day B pitches hay onto the wagon to A, who builds the load and hauls to the barn with team a. A and B unload. One works in the mow and the

other unloads the hay with a pitchfork.

WORK CHART 1.—*Alfalfa loaded and unloaded by hand (Colorado).*

[This method is adapted to about 20 acres.]

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6
First day:			
Mowing.....	A	a	m m m m m m m m
Raking.....	A	a	r r r r r
Second day:			
Hauling.....	A	a	h h h h h h h h h h h h
Pitching.....	B		p p p p p p p p p p p p
Unloading.....	(AB)		u u u u u u u u u u u u

Two men and two horses put up 2 tons (2 acres) per day, or 4 tons every other day. Yield 1 ton per acre. Man-hours 4.61, team-hours 3.12 per acre. Labor cost, per ton, $1.546.

METHOD 2.

This small 2-man crew is limited to 30 acres of tame hay in a haying season lasting 10 working days. If the haul is short and the pitcher is a fairly strong man, 4½ tons can be put into the barn each afternoon. When unloading, the man who sticks the fork will have to drive team on hayfork, using a short ladder to reach the ground, unless a woman, boy, or girl drives the team. If the hay is not tedded, the labor cost will be reduced about 18 cents per ton. This is a very good method for a small acreage of hay when two men can devote nearly all day to haying.

WORK CHART 2.—*Timothy and clover loaded by hand and unloaded with horse fork (Wisconsin).*

[This method is adapted to 30 acres.]

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6
Mowing.....	A	a	m m m m m m
Tedding.....	B	b	t t t t
Raking.....	B	b	r r r r
Hauling.....	A	a	h h h h h h h h h h
Pitching.....	B		p p p p p p p p p p
Unloading.....	(AB)	b	u u u u u u u u u u

Two men and four horses put up 4.5 tons (3 acres) per day. Yield 1.5 tons per acre. Man-hours 3.77, team-hours 3.77 per ton. Labor cost, per ton, $1.508.

Method 3.

This is a very common method, involving the use of the tedder, which can be used on areas up to 40 acres. The hay is tedded in the forenoon, and after dinner is raked with a side-delivery rake. When raking is finished, the man raking takes his team to the barn, involving a brief interval of time, and helps load and unload the remainder of the afternoon.

Work Chart 3.—*Timothy and clover loaded by hand; unloaded with horses (Wisconsin).*

[This method is used on 40 acres of hay.]

Operation	Men	Teams	Time required														
			6	7	8	9	10	11	12	1	2	3	4	5	6	7	
Mowing.....	A	a				m	m	m	m	m	m						
Tedding.....	B	b				t	t	t	t	t	t						
Raking.....	A	a								r	r	r	r				
Pitching.....	C									p	p	p	p	p	p	p	p
Pitching.....	A												p	p	p	p	p
Hauling.....	B	b								h	h	h	h	h	h	h	h
Unloading.....	(CB)	(b)								u	u	u	u	u			
Unloading.....	(CBA)	a											u	u	u	u	u

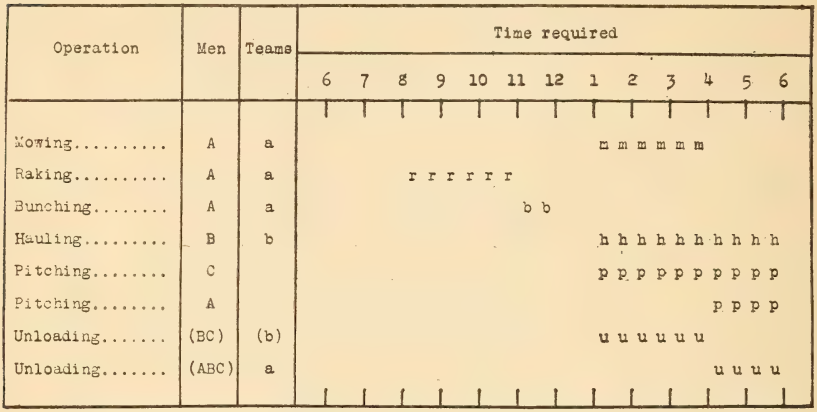
Three men and four horses put up 6 tons (4 acres) per day. Yield, per acre, 1.50 tons. Man-hours 4, team-hours 3 per ton. Labor cost, per ton, $1.40.

Method 4.

This crew works a little faster than the ordinary three-man crew. That 6 tons can be pitched by one man (C), with the help of A the last two hours in the afternoon, is due to the fact that the rake is used to put the hay into small bunches, thus enabling the pitchers to make better time. If the hay were not bunched, it would be necessary to mow in the morning, so that A could help pitch all afternoon. This method will handle 4 acres a day, or 40 acres in 10 working days.

WORK CHART 4.—*Timothy and clover loaded by hand and unloaded with horses (Iowa).*

[This method is adapted to 40 acres of hay.]


Operation
Men
Teams
Time required
6 7 8 9 10 11 12 1 2 3 4 5 6
Mowing..... A a m m m m m m
Raking..... A a r r r r r r
Bunching..... A a b b
Hauling..... B b h h h h h h h h h h
Pitching..... C p p p p p p p p p p
Pitching..... A p p p p
Unloading..... (BC) (b) u u u u u u
Unloading..... (ABC) a u u u u

Three men and 4 horses put up 6 tons (4 acres) per day. Yield, 1.50 per tons per acre. Man-hours 3.16, team-hours 2.33 per ton. Labor cost, per ton, $1.089.

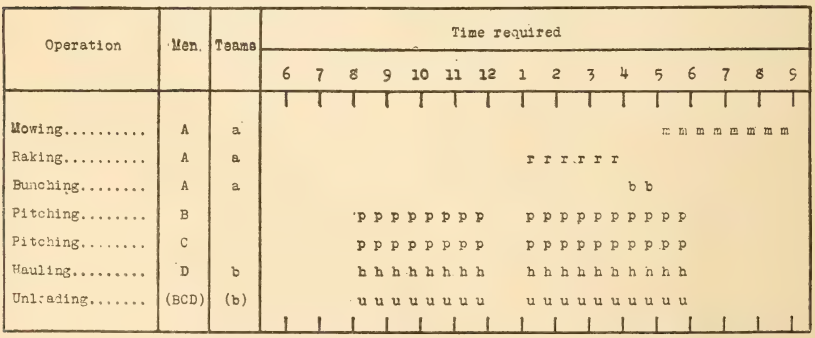
METHOD 5.

A good system of management for a small crew, when it is desired to cut hay late in the afternoon. The dew or rain falling on hay thus freshly cut will not be as injurious as if the hay were partly cured. It will require a 6-foot mower and a good, strong team to cut 6 acres in 4 hours. However, the team can be speeded up, as the mowing is done in the coolest part of the day.

The outstanding objection to this method is the long hours in the afternoon for A, who works 8 hours after 1 o'clock. In such a case, the farmer himself would naturally do the moving, since he could hardly expect a hired man to work so late.

WORK CHART 5.—*Timothy and clover loaded by hand and unloaded with horse fork (New York).*

[This method is used on 30 acres of hay, but is adapted to 60 acres.]


Operation
Men.
Teams
Time required
6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9
Mowing..... A a m m m m m m m m
Raking..... A a r r r r r r
Bunching..... A a b b
Pitching..... B p p p p p p p p p p p p p p p p
Pitching..... C p p p p p p p p p p p p p p p p
Hauling..... D b h h h h h h h h h h h h h h h h
Unloading..... (BCD) (b) u u u u u u u u u u u u u u u u

Four men and 4 horses put up 9 tons (6 acres) per day. Yield, 1.50 tons per acre. Man-hours 3.87, team-hours 1.89 per ton. Labor cost, per ton, $1.152.

METHOD 6.

This crew consists of 5 men and 6 horses. It puts up 10 acres of hay a day, and hence could care for 100 acres in ten working days, the usual length of the haying season (one cutting). All of the men work all day at haying except the man raking, who works only in the afternoon. On most farms producing 100 acres of hay, there is always other work to be done besides haying, and this method allows one man to do other farm work in the morning.

A weakness of this method is that when there is a heavy dew the crew may be idle an hour or two in the morning. In order to obviate this and get in a full day's work, enough hay should be bunched late in the afternoon to keep the crew busy in the morning until the dew is gone and the hay is in proper condition to be taken up from the windrow.

The labor cost for this crew is $0.93 per ton, which is very low for this system.

If another similar crew is used one rake will rake for both crews and will be kept busy all day.

WORK CHART 6.—*Timothy and clover loaded by hand, unloaded with horses (New York).*

[This method is adapted to 100 acres of hay.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing	A	a		m	m	m	m	m	m	m	m	m	m	m	m
Raking	B	b								r	r	r	r	r	r
Hauling	C	c		h	h	h	h	h	h	h	h	h	h	h	h
Pitching	D			p	p	p	p	p	p	p	p	p	p	p	p
Pitching	E			p	p	p	p	p	p	p	p	p	p	p	p
Unloading	(CDE)	(c)		u	u	u	u	u	u	u	u	u	u	u	u

Five men and 6 horses put up 15 tons (10 acres) per day. Yield per acre, 1.50 tons. Man-hours 3.0, team-hours 1.66 per ton. Labor cost, per ton, $0.932.

METHOD 7.

This is a rather expensive method, considerable time being lost while waiting for the dew to go off in the morning. Hay is cut in the morning and tedded in the afternoon, and raked the following morning. The hauling crew is one man short in the forenoon, and there is a loss of 2 hours by man and team after the tedding is finished. Two loads are hauled in by noon, and in the afternoon the remainder of the 6 tons are hauled in. This is not a speedy crew, but is fairly representative of crews on some farms having 40 to 50 acres of timothy and clover hay. In the afternoon, B pitches and team b is used at

the barn to unload. E remains at the barn to drive team on hay rope. E is an old man not able to pitch in the field.

WORK CHART 7.—*Timothy and clover loaded by hand and unloaded with horse fork (New York).*

[This method is adapted to 40 acres of hay.]

Operation	Men	Teams	Time required											
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a			m	m	m	m	m						
Tedding.....	A	a								t	t	t	t	t	t
Raking.....	B	b				r	r	r	r						
Hauling.....	C	c				h	h	h	h	h	h	h	h	h	h
Pitching.....	D					p	p	p	p	p	p	p	p	p	p
Pitching.....	B									p	p	p	p	p	p
Unloading.....	E					u	u	u	u	u	u	u	u	u	u
Unloading.....	(CD)	(c)				u	u	u	u						
Unloading.....	(BCD)	b								u	u	u	u	u	u

Five men and 6 horses put up 6 tons (4 acres) per day. Yield, 1.5 ton per acre. Man-hours 6.5, team-hours 3.83 per ton. Labor cost, $2.06 per ton.

METHOD 8.

This method, employing 6 men and 4 horses, is used by a farmer in Pennsylvania. Only 2 men (both of whom work on the farm all the year round) work all day at haying. The other 4, hired for the afternoon only, are transient labor.

When load reaches the barn, it is left standing to be unloaded, while team goes to the field with a second wagon to be loaded. Three men remain at the barn all of the time and are idle over half of the time. The 2 pitchers are idle while team goes to and returns from barn. The method is given to illustrate poor labor management. A way to remedy this would be to do away with the barn crew entirely and have the two pitchers go to the barn and help unload, or to provide teams and wagons enough to keep the barn crew busy. This, in turn, would necessitate using the mower and rake longer.

WORK CHART 8.—*Timothy and clover loaded by hand and unloaded with horse fork (Pennsylvania.)*

[This method is adapted to 50 acres of hay.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a			m	m	m	m	m	m	m				
Raking.....	B	b			r	r	r	r	r	r	r				
Hauling.....	A	a								h	h	h	h	h	h
Pitching.....	B									p	p	p	p	p	p
Pitching.....	C									p	p	p	p	p	p
Unloading.....	D	b								u	u	u	u	u	u
Unloading.....	E									u	u	u	u	u	u
Unloading.....	F									u	u	u	u	u	u

Six men and 4 horses put up 7.5 tons (5 acres) per day. Yield, 1.50 tons per acre. Man-hours 5.06, team-hours 2.4 per ton. Labor cost, $1.49.

METHOD 9.

This is a one-crew system used on a farm in New Jersey, where over 500 acres of alfalfa are grown. It is a very good method for sections where unfavorable weather makes it necessary to cure in the cock under hay caps. In this instance, the 3 men cocking were experienced haymakers who did about as much work as 4 green, transient laborers would do. (See fig. 4.)

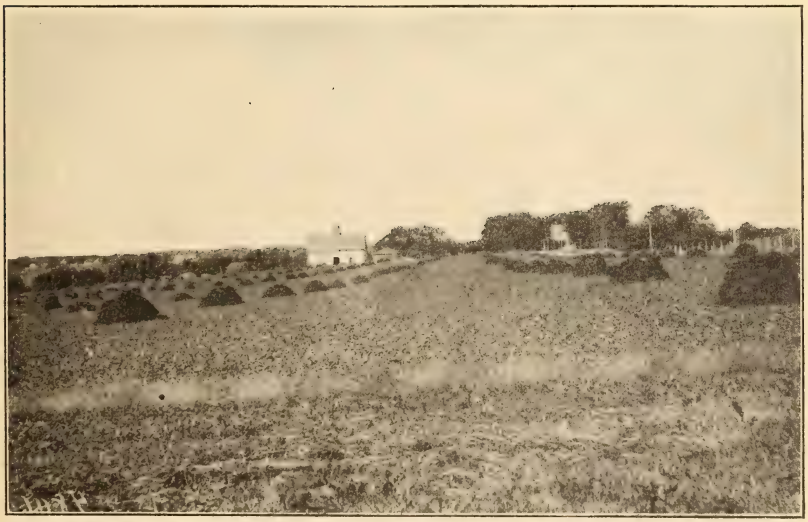


FIG. 4.—Legume hay curing in well-made cocks. Hay put into the cock when well wilted will turn a certain amount of rain, but hay caps should be used if the cocks are to stand several days.

WORK CHART 9.—*Alfalfa cured in the cock; loaded by hand and unloaded with horse fork. This crew is one unit on a farm where 500 acres of alfalfa are grown (New Jersey).*

Operation	Men	Teams	Time required: 6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a		m	m	m	m	m	m	m	m	m	m	m	m	m	m
Raking.....	B	b		r	r	r	r	r	r	r	r	r	r	r	r	r	r
Cocking.....	C			c	c	c	c	c	c	c	c	c	c	c	c	c	c
Cocking.....	D			c	c	c	c	c	c	c	c	c	c	c	c	c	c
Cocking.....	E			c	c	c	c	c	c	c	c	c	c	c	c	c	c
Capping and uncapping cocks.	F G	c		c c	c c	c c	c c	c c	c c	c c	c c	c c	c c	c c	c c	c c	c c
Pitching.....	H			p	p	p	p	p	p	p	p	p	p	p	p	p	p
Pitching.....	I			p	p	p	p	p	p	p	p	p	p	p	p	p	p
Pitching.....	J			p	p	p	p	p	p	p	p	p	p	p	p	p	p
Pitching.....				p	p	p	p	p	p	p	p	p	p	p	p	p	p
Hauling.....	K	d		h	h	h	h	h	h	h	h	h	h	h	h	h	h
Hauling.....	L	e		h	h	h	h	h	h	h	h	h	h	h	h	h	h
Unloading.....	M			u	u	u	u	u	u	u	u	u	u	u	u	u	u
Unloading.....	N			u	u	u	u	u	u	u	u	u	u	u	u	u	u
Unloading.....	O			u	u	u	u	u	u	u	u	u	u	u	u	u	u
Unloading.....	[1]P			u	u	u	u	u	u	u	u	u	u	u	u	u	u

[1] Operates gasoline engine used for unloading.

Fifteen men, 1 boy, and 9 horses put up 27 tons (15 acres) of hay per day. Yield, 1.80 tons per acre. Man-hours 5.42, horse-hours 3.07 per ton. Labor cost, $1.39 per ton. Cost of labor and engine charges, $1.43 per ton.

System 2.—Loading With Loader.

In system 2 hay is loaded with hay loader and unloaded with horse fork.

The loader, when used, will be found usually on farms with a hay area of from 60 to 150 or more acres. For such areas the labor cost with the loader usually is less than that of loading by hand, and more work will be done by a crew using a loader than by the same crew pitching by hand. The loader is used to best advantage if a side delivery rake is used, for the reason that after but one round has been made with the rake the loader can start. (See fig. 5.)

When the yield is heavy the rake can be dispensed with and the hay taken directly from the swath. The loader adds considerably to the cost of the hay equipment, and repairs are quite an item if it is not properly handled.

Many farmers say that hired help do not like to use the loader, because it makes the work of building the load a strenuous job. Slings can be used to advantage with the loader.

Method 10.

This method was found on a farm where help was scarce and the crew short. The first load is put on by one man, the other raking with side-delivery rake. When load is on, the second load has been

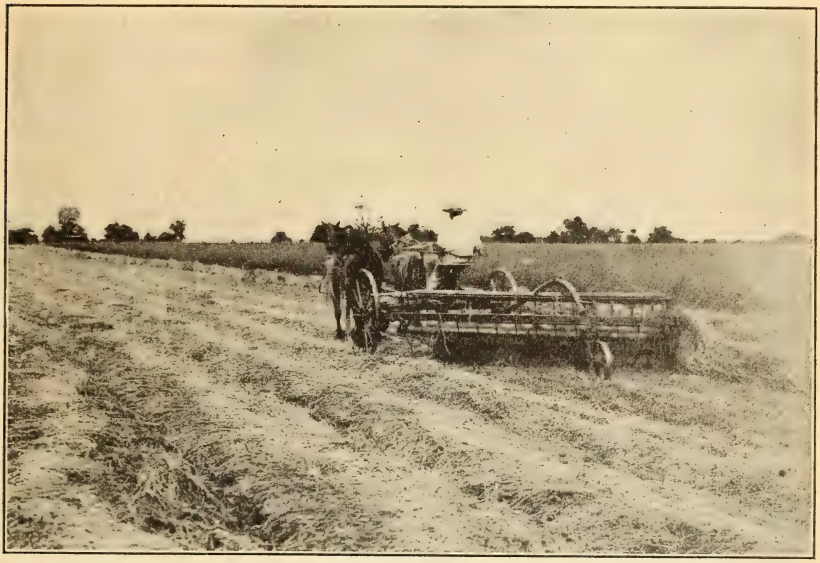


Fig. 5.—The side-delivery rake in operation. It puts the hay in loose windrows which allow a free circulation of the air. If used, however, when the hay is nearly cured, there is liable to be a large leaf loss, especially with legume hay.

raked. Both men go to barn and unload. The second, and every alternate load thereafter, both men load. They change places every other load. The team on wagon needs no driver when loading. This method calls for very hard work. The amount of hay made is above the average for a two-man crew.

Work Chart 10.—*Timothy and clover loaded with loader and unloaded with horse fork (Ohio).*

[This method is adapted to 60 acres.]

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6 7
Mowing.....	A	a	m m m m m m m m m m
Raking.....	A or B	a	r r r r r r r r r r r r
Hauling.....	A or B	b	h h h h h h h h h h h h
Unloading.....	(AB)	(b)	u u u u u u u u u u u u

Two men and four horses put up 9 tons (6 acres) per day. Yield, 1.50 tons per acre. Man-hours 1.83, team-hours 1.83 per ton. Labor cost, per ton, $0.732.

METHOD 11.

This method is in common use and adapted to an acreage up to 80 acres. Three men work on the wagon. One drives and the other two build the load, and 12 tons are put into the barn in 6 hours. This is perhaps the maximum amount of hay that a crew of this size can handle in one afternoon. In order to accomplish this amount of work, large hay racks will have to be used, so that more than the average amount of hay is hauled per load. It will also be necessary that the distance from the field be short, say not over a quarter of a mile. (See fig. 6.)

FIG. 6.—Unloading hay at the barn with horse power. The horse fork eliminates man labor and makes a considerable saving in time in unloading.

WORK CHART 11.—*Timothy and clover loaded with loader; unloaded with horses (New York).*

[This method is adapted to 80 acres.]

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6 7
Mowing.....	A	a	m m m m m m m
Mowing.....	B	b	m m m m m m m
Raking.....	B	b	r r r r r r r r r r
Loading.....	A		l l l l l l l l l l l
Loading.....	C		l l l l l l l l l l l
Hauling.....	D	a	h h h h h h h h h h h
Unloading.....	(ACD)	(a)	u u u u u u u u u u u

Four men and 4 horses put up 12 tons (8 acres) per day. Yield, 1.50 tons per acre. Man-hours 2.50, team-hours 1.50 per ton. Labor cost, per ton, $0.80.

METHOD 12.

This method is used on a farm growing 25 acres of hay. Only one man works in the forenoon—from 11 to 12 o'clock—raking. The hay is cut late in the afternoon, and the crew hauling from field work from 12.30 until 7 p. m., getting in 7.5 tons, which is below the average for such a crew. A long haul to barn or a slow working crew must account for the fact that so little hay is hauled in in 6.5 hours.

WORK CHART 12.—*Timothy and clover loaded with loader; unloaded with horse fork (New Jersey).*

[This method is adapted to 50 acres.]

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8
Mowing.....	A	a	m m m m m m m m m
Raking.....	A	a	r r r r r
Hauling.....	B	b	h h h h h h h h h h h h h
Loading.....	C		l l l l l l l l l l l l l
Loading.....	D		l l l l l l l l l l l l l
Unloading.....	(BCD)	(b)	u u u u u u u u u u u u u

Four men and 4 horses put up 7.5 tons (5 acres) per day. Yield, 1.5 tons per acre. Man-hours 3.53, team-hours 1.80 per ton. Labor cost, per ton, $1.066.

METHOD 13.

This method is in common use in New York on farms where the hay area is 60 acres or less. The objection to this method is that one man (A) gets through working (raking) at 4 o'clock in the afternoon and must remain idle or find some other profitable work to do with his team for two hours, a thing not always feasible. In the forenoon B, C, and D can work on other crops. A boy can be substituted for the man driving team while loading without lessening the efficiency of the crew.

WORK CHART 13.—*Timothy and clover loaded with loader; unloaded with horse fork (New York).*

[This method is adapted to 60 acres.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a			m	m	m	m	m	m	m				
Raking.....	A	a								r	r	r	r	r	
Hauling.....	B	b								h	h	h	h	h	h	h	h
Loading.....	C									l	l	l	l	l	l	l	l
Loading.....	D									l	l	l	l	l	l	l	l
Unloading.....	(BCD)	(b)								u	u	u	u	u	u	u	u

Four men and 4 horses put up 6 tons (6 acres) per day. Yield, 1 ton per acre. Man-hours 3.75, team-hours 2.08 per ton. Labor cost, per ton, $1.166.

METHOD 14.

This crew, using two teams to haul from the field, and a barn crew of two men, put in about the same amount of hay as the four-man crew in method 11. The small yield (only 1.25 tons per acre) and a longer haul made it necessary to use the second team for hauling in. This method is in common use in Iowa.

Compare the labor required and cost of this method with No. 16, in which the tedder is used. In both methods the hay is not raked, but is taken directly from swath with loader.

WORK CHART 14.—*Timothy loaded with loader and unloaded with horse fork (Iowa).*

[This method is adapted to 100 acres.]

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6
Mowing.....	A	a	m m m m m m m m m m
Mowing.....	B	b	m m m m m m m m m m
Hauling.....	A	a	h h h h h h h h h h
Hauling.....	B	b	h h h h h h h h h h
Loading.....	C		l l l l l l l l l l
Unloading.....	D		u u u u u u u u u u
Unloading.....	E		u u u u u u u u u u
Unloading.....	(A)	(a)	u u u u u u u u u u
Unloading.....	(B)	(b)	u u u u u u u u u u

Five men and 4 horses put up 12.5 tons (10 acres) per day. Yield, 1.25 tons per acre. Man-hours 2.80, team-hours 1.62 per ton. Labor cost, $0.882 per ton.

METHOD 15.

This method is used for making clover hay when it is desired to cure it quickly. The reason the cost is so high in this case is that the hay is tedded twice. The rake is not used and the loader takes up the hay from the swath. The one objection to this labor arrangement is that one man remains at the barn all of the time to mow away the hay. When hay is taken from the swath, the teams on wagon will require a driver. If E went to the field, it would allow two men to load and one to drive. Taking up hay from the swath entails less strenuous work in loading than does taking from windrow.

WORK CHART 15.—*Clover loaded with loader; unloaded with horse fork (Ohio).*

[This method is adapted to 60 acres.]

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6 7
Mowing.....	A	a	m m m m m m
Mowing.....	B	b	m m m m m m
Tedding.....	A	a	t t t t t t t t t t t t
Hauling.....	C	[1]cd	h h h h h h h h h h h h
Loading.....	D		l l l l l l l l l l l l
Unloading.....	E	(c or d)	u u u u u u u u u u u u
Unloading.....	(CD)		u u u u u u u u u u u u

[1] Four horses are used on wagon.

Five men and 8 horses put up 9 tons (6 acres) per day. Yield, 1.5 tons per acre. Man-hours 3.33, team-hours 3 per ton. Labor cost, per ton, $1.266.

METHOD 16.

The tedder starts at 10 o'clock on hay cut the day before. This gives the first hay tedded three hours exposure to the sun. This method is in common use, although most farmers prefer to rake the hay without tedding, unless the yield is 2 tons or more per acre.

WORK CHART 16.—*Timothy and clover loaded with loader and unloaded with horse fork (Iowa).*

[This method is adapted to 100 acres.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a		m	m	m	m	m	m	m					
Mowing.....	B	b		m	m	m	m	m	m	m					
Tedding.....	C	c					t	t	t	t	t	t	t	t	t
Hauling.....	A	a								h	h	h	h	h	h
Hauling.....	B	b								h	h	h	h	h	h
Loading.....	D									l	l	l	l	l	l
Unloading.....	E									u	u	u	u	u	u
Unloading.....	F									u	u	u	u	u	u
Unloading.....	(AB)	(a or b)								u	u	u	u	u	u

Six men and 6 horses put up 12.5 tons (10 acres) per day. Yield, 1.25 tons per acre. Man-hours 3.36, team-hours 2.16 per ton. Labor cost, per ton, $1.104.

METHOD 17.

This method is in common use in southern Iowa, where timothy is headed for seed. After being headed, the stubble is cut for hay. The loader can be used to advantage, because the hay (or rather straw) is very light and only two men are needed on the wagon, one driving and the other building the load. If the field is much more than a quarter of a mile from the barn, a third team and wagon can be used to advantage, as two teams hauling will not keep the barn crew busy all of the time. By using three teams for hauling, the labor cost per ton should be lowered slightly.

WORK CHART 17.—*Headed timothy loaded with loader and unloaded with horse fork (Iowa).*

[This method is adapted to 140 acres.]

Operation	Men	Teams	Time required														
			6	7	8	9	10	11	12	1	2	3	4	5	6	7	
Mowing.....	A	a			m	m	m	m	m	m	m	m	m	m	m	m	m
Raking..... [1]	B	b			r	r	r	r	r	r	r	r	r	r	r	r	r
Hauling.....	C	c			h	h	h	h	h	h	h	h	h	h	h	h	h
Hauling.....	D	d			h	h	h	h	h	h	h	h	h	h	h	h	h
Loading.....	E				l	l	l	l	l	l	l	l	l	l	l	l	l
Unloading.....	F	e			u	u	u	u	u	u	u	u	u	u	u	u	u
Unloading.....	G				u	u	u	u	u	u	u	u	u	u	u	u	u
Unloading.....	H				u	u	u	u	u	u	u	u	u	u	u	u	u

[1] Field raked twice.

Eight men and 10 horses put up 14 tons (14 acres) per day. Yield, 1 ton per acre. Man-hours 4.28, team-hours 2.80 per ton. Labor cost, per ton, $1.416.

METHOD 18.

This method is given in order to show the advantage of using boys to fill out a crew. Two teams are used to haul from field. Two men build the load and one man sticks the fork at the barn. Thus, the third person on the wagon has nothing to do but drive. Boys can do this just as well as men, and they cost only half as much. With this method a crew of 7 men and 3 boys will put up hay for $1.02 per ton, while the cost of a crew of 10, all men, will increase the cost per ton by 12 cents, making the total cost $1.14 per ton. It is often possible to hire town boys for the easy work of driving the team on loads as well as for hoisting hay.

WORK CHART 18.—*Timothy and clover loaded with loader; unloaded with horse fork (Iowa).*

[This method is adapted to 125 acres.]

Operation	Men	Teams	Time required													
			6	7	8	9	10	11	12	1	2	3	4	5	6	
Mowing.....	A	a			m	m	m	m	m	m	m	m	m	m	m	m
Raking.....	B	b		r	r	r	r	r	r	r	r					
Tedding.....	B	b								t	t	t	t	t	t	t
Hauling.....	C	c		h	h	h	h	h	h	h	h	h	h	h	h	h
Hauling.....	D	d		h	h	h	h	h	h	h	h	h	h	h	h	h
Loading.....	E			1	1	1	1	1	1	1	1	1	1	1	1	1
Loading.....	F			1	1	1	1	1	1	1	1	1	1	1	1	1
Unloading.....	G			u	u	u	u	u	u	u	u	u	u	u	u	u
Unloading.....	H			u	u	u	u	u	u	u	u	u	u	u	u	u
Unloading.....	I			u	u	u	u	u	u	u	u	u	u	u	u	u
Unloading.....	J	e		u	u	u	u	u	u	u	u	u	u	u	u	u

Seven men, 3 boys, and 9 horses put up 25 tons (12.5 acres) per day. Yield, 2 tons per acre. Man-hours 3.66, horse-hours 3.50 per ton. Labor cost, $1.02 per ton. Three wagons are used in hauling with 2 boys driving. One boy drives team on hay rope.

METHOD 19.

This crew is the same as No. 18 would be if composed entirely of men, except that an additional man and team work in the forenoon. With a yield of 2 tons per acre, but one mower mowing all day would be required, but with a yield of only 1.5 tons per acre it is necessary to use the second mower half a day in order to get enough hay (25 tons) cut to keep the hauling and barn crew busy. The use of 3 boys in place of men would reduce the cost 10 cents per ton.

WORK CHART 19.—*Timothy and clover loaded with loader; unloaded with horse fork (Iowa).*

[This method is adapted to 170 acres.]

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6
Mowing.....	A	a	m m m m m m m m m m m m
Mowing.....	B	b	m m m m m m m m m
Raking.....	C	c	r r r r r r r r r r r r r r r r r r r r r r r r
Hauling.....	D	d	h h h h h h h h h h h h h h h h h h h h h h h h
Hauling.....	E	e	h h h h h h h h h h h h h h h h h h h h h h h h
Loading.....	F		l l l l l l l l l l l l l l l l l l l l l l l l
Loading.....	G		l l l l l l l l l l l l l l l l l l l l l l l l
Unloading.....	H	[1]f	u u u u u u u u u u u u u u u u u u u u u u u u
Unloading.....	I		u u u u u u u u u u u u u u u u u u u u u u u u
Unloading.....	J		u u u u u u u u u u u u u u u u u u u u u u u u
Unloading.....	K		u u u u u u u u u u u u u u u u u u u u u u u u

[1] One horse used for unloading.

Eleven men and 11 horses put up 25.5 tons (17 acres) per day. Yield, 1.5 tons per acre. Man-hours 4.03, horse-hours 3.76 per ton. Labor cost, per ton, $1.18.

METHOD 20.

This is a rather large crew, adapted to an area of 300 acres or more. The men are all employed throughout the day and there is no lost or idle time. Two teams and three wagons are used to haul in. As soon as a load arrives at barn, the team is hitched to an empty wagon, while the barn crew of 4 men unload. Two men remain in the field all of the time, to build load, so there is always one wagon loading, one being unloaded, and one on way between barn and field. This is a very efficient method.

WORK CHART 20.—*Timothy and clover loaded with loader; unloaded with horse fork (New York).*

[This method is adapted to 300 acres.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a		m	m	m	m	m	m	m	m	m	m	m	m	m	m
Mowing.....	B	b		m	m	m	m	m	m	m	m	m	m	m	m	m	m
Mowing.....	C	c		m	m	m	m	m	m	m	m	m	m	m	m	m	m
Raking.....	D	d		r	r	r	r	r	r	r	r	r	r	r	r	r	r
Hauling.....	E	e		h	h	h	h	h	h	h	h	h	h	h	h	h	h
Hauling.....	F	f		h	h	h	h	h	h	h	h	h	h	h	h	h	h
Loading.....	G			l	l	l	l	l	l	l	l	l	l	l	l	l	l
Loading.....	H			l	l	l	l	l	l	l	l	l	l	l	l	l	l
Unloading.....	I			u	u	u	u	u	u	u	u	u	u	u	u	u	u
Unloading.....	J	g		u	u	u	u	u	u	u	u	u	u	u	u	u	u
Unloading.....	K			u	u	u	u	u	u	u	u	u	u	u	u	u	u
Unloading.....	L			u	u	u	u	u	u	u	u	u	u	u	u	u	u

Twelve men and 14 horses put up 45 tons (30 acres) per day. Yield, 1.5 tons per acre. Man-hours 2.66, team-hours 1.55 per ton. Labor cost, $0.842 per ton.

System 3.—Stacking With Push Rakes and Stacker.

The machinery used in making hay in the Middle Western States is very different from that used in the Eastern States. There are two reasons for this. First, a large percentage of the hay is stacked; second, horse labor is used as much as possible in order to reduce man labor, which is often hard to obtain. By using the push rake and stacker, the only hand labor needed is on the stack. (See figs. 7 and 8.)

Push rakes, also locally known as "sweeps," "runabouts," "bull rakes," and "go devils," differ considerably in details of construction. The capacity or amount of work done per day varies with the type of push rake, the skill of man and team operating it, yield per acre, etc. (See fig. 9.)

METHOD 21.

This method compares very favorably with method No. 23, the difference being that it requires fewer men by one to stack almost as much hay as do the three men and one boy crew of No. 23. A boy could easily replace one of the men in this crew by raking in the forenoon and driving the team on the stacker in the afternoon. This method is in common use in the Middle West.

FIG. 7.—A well-built stack of western hay. Stacks like this lose a very small percentage of hay from damage by sun or rain.

FIG. 8.—A group of well-built western stacks. Stacking such a large amount of hay in one place makes the cost of making hay very much greater than when the stacks are distributed over the field.

FIG. 9.—The push rake in operation. Horses do all of the labor of lifting the hay. From 600 to over 1,000 pounds of hay can be hauled per load. The skill of the driver and team are important factors in the efficient use of the push rake.

WORK CHART 21.—*Clover stacked with push rake and stacker (Nebraska).*

[This method is adapted to 60 acres.

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6
Mowing.....	A	a	m m m m m m m
Mowing.....	B	b	m m m m m m m
Raking.....	C	c	r r r r r r r r
Push raking.....	A		p p p p p p p p p
Stacking.....	B	b	s s s s s s s s s
Stacking.....	C		s s s s s s s s s

Three men and 6 horses put up 9 tons (6 acres) per day. Yield, 1.5 tons per acre. Man-hours 2.88, team-hours 1.77 per ton. Labor cost, $0.93 per ton.

METHOD 22.

This three-man crew arrangement is used on a sugar-beet farm in Kansas for a small acreage (not over 50 acres) where it is desired to allow all time possible for working in the beet field. Two men work the first day, one the second, and three the third day. By this method 32 acres, or 32 tons of hay, are harvested and put into the stack per week. The cost is considerably more than for method 24.

WORK CHART 22.—*Alfalfa stacked with push rakes and stacker (Kansas).*

[This method is adapted to about 50 acres.]

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6
First day:			
Mowing.....	A	a	m m m m m m m m m m m m m
Mowing.....	B	b	m m m m m m m m m m m m m
Second day:			
Raking.....	A	a	r r r r r r r r r r r r r
Third day:			
Push raking...	A	a	p p p p p p p p p p p p p
Push raking...	B	b	p p p p p p p p p p p p p
Stacking.....	C	c	s s s s s s s s s s s s s

Three men and 6 horses put up 16 tons (16 acres) every three days, or an average of 5.33 tons per day. Yield, 1 ton per acre. Man-hours 3.50, team-hours 3.50 per ton. Labor cost, $1.40 per ton.

METHOD 23.

This is a very good method for timothy and clover hay on areas up to 70 acres, especially where other farm work presses. It allows two of the crew to do other farm work in the forenoon. In the afternoon four men work all afternoon and stack 10.5 tons.

WORK CHART 23.—*Timothy and clover stacked with push rakes and stacker (Iowa).*

[This method is adapted to 70 acres.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a				m	m	m	m	m	m				
Mowing.....	B	b				m	m	m	m	m	m				
Raking.....	A	a								r	r	r	r	r	r
Push raking.....	B	b								p	p	p	p	p	p
Push raking.....	A	a												p	p
Stacking.....	C									s	s	s	s	s	s
Stacking.....	D	c								s	s	s	s	s	s

Three men, 1 boy, and 6 horses put up 10.5 tons (7 acres) per day. Yield, 1.5 tons per acre. Man-hours 2.33, team-hours 2.09 per ton. Labor cost, $0.884 per ton.

METHOD 24.

This method is to be recommended in the West for a small acreage when there is considerable other work to be done. It can be used to advantage on a sugar-beet farm. Hay is only cut two days in the week, thus limiting the use of the method to about 100 acres of hay.

WORK CHART 24.—*Alfalfa stacked with push rakes and stacker (Kansas).*

[This method is adapted to about 100 acres.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
First day:															
Mowing.....	A	a		m m	m m	m m	m m	m m	m m	m m	m m	m m	m m		
Mowing.....	B	b		m m	m m	m m	m m	m m	m m	m m	m m	m m	m m		
Mowing.....	C	c		m m	m m	m m	m m	m m	m m	m m	m m	m m	m m		
Raking.....	A	a											r r	r r	
Raking.....	B	b											r r	r r	
Second day:															
Raking.....	A	a		r r	r r	r r	r r	r r	r r						
Raking.....	B	a		r r	r r	r r	r r	r r	r r						
Push raking...	A	a								p p	p p	p p	p p	p p	p
Push raking...	B	b								p p	p p	p p	p p	p p	p
Stacking.....	C	c								s s	s s	s s	s s	s s	s
Stacking.....	D									s s	s s	s s	s s	s s	s
Third day:															
Push raking...	A	a		p p	p p	p p	p p	p p	p p						
Push raking...	B	b		p p	p p	p p	p p	p p	p p						
Stacking.....	C	c		s s	s s	s s	s s	s s	s s						
Stacking.....	D			s s	s s	s s	s s	s s	s s						

Four men and 6 horses put up 26 tons (26 acres) in 2.50 days. Yield, 1 ton per acre. Man-hours 3, team-hours 2.61 per ton. Labor cost, $1.12 yer ton.

METHOD 25.

This method is used extensively in the prairie hay section of Oklahoma. It is not a very good one for the reason that only one sweep rake being used; the stacker is not kept very busy. Also, the rake is idle half of the day, and the stacker team and man driving it are idle over half of the time. If two mowers and two sweep rakes were used, the rake would be kept busy all day, and twice as much could be put into the stack without increasing the crew at the stack. Thus, the cost per ton would be lessened materially. (See method 31.)

WORK CHART 25.—*Prairie hay stacked with push rake and stacker (Oklahoma).*

[This crew can harvest 100 acres in 10 working days.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing	A	a		m	m	m	m	m	m	m	m	m	m	m	m
Raking	B	b								r	r	r	r	r	r
Push raking	C	c		p	p	p	p	p	p	p	p	p	p	p	p
Stacking	D	d		s	s	s	s	s	s	s	s	s	s	s	s

Four men and 8 horses put up 10 tons or 10 acres per day. Yield, 1 ton per acre. Man-hours 3.50, team-hours 3.50 per ton. Labor cost, $1.40 per ton

METHOD 26.

This method does not require the use of a stacker. A few alfalfa growers in Kansas claim that it does not pay to buy a stacker to be used only 2 or 3 days at each cutting. The labor cost in this case is

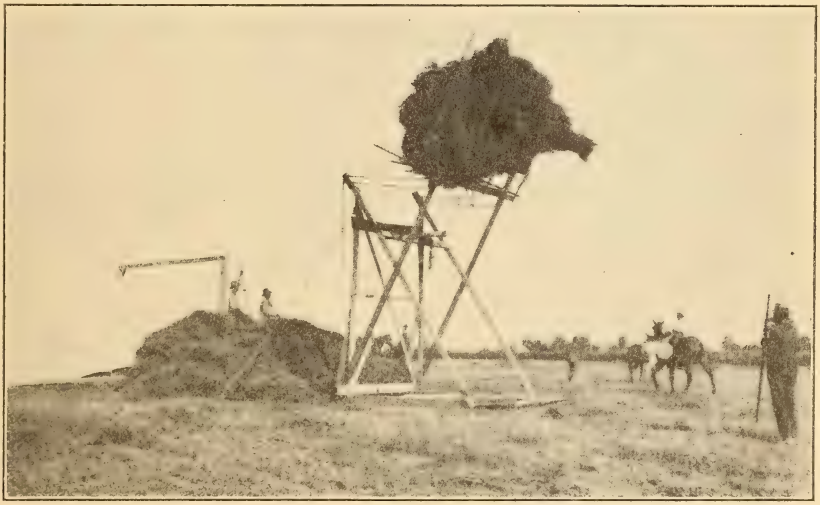


FIG. 10.—The haystacker in operation. The load is almost ready to be dumped on to the stack. No hard labor is required.

much higher than that for the average when a stacker is used, and the yield is but 1 ton per acre. If there is other farm work requiring 6 regular men, or if extra labor can be hired just when wanted, then it might be questionable if it would pay to buy a stacker. If help is scarce, however, 3 or 4 men, with 4 to 6 horses and a stacker, will put up as much hay as the 6 men and 4 horses, not using a stacker. (See fig. 10.)

WORK CHART 26.—*Stacking alfalfa. Hay is brought to stack with push rake and pitched upon stack by hand.*

[This method is adapted to a small acreage, where it will not pay to buy a stacker.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a			m m	m m	m m	m m	m m	m		m m	m m	m m	m m
Raking.....	B	b								r		r r	r r	r r	r r
Push raking.....	C	c			p	p p	p p	p p	p p	p		p p	p p	p p	p p
Stacking.....	D				s	s s	s s	s s	s s	s		s s	s s	s s	s s
Stacking.....	E				s	s s	s s	s s	s s	s		s s	s s	s s	s s
Stacking.....	F				s	s s	s s	s s	s s	s		s s	s s	s s	s s

Six men and 6 horses put up 10 tons (10 acres) per day. Yield, 1 ton per acre. Man-hours 5.1, team-hours 1.92 per ton. Labor cost, $1.40 per ton.

METHOD 27.

This method is well adapted to alfalfa on a farm growing sugar beets, or other crops that compete with hay in labor demands. Only one man works all forenoon. The second man starts raking at 10 o'clock, leaving 5 men free for other farm work. The amount handled per sweep in the afternoon (8 tons) indicates that the sweeps work fast and efficiently.

The only fault that could be found with this method lies in the long hours for the mower. This is necessary in order to keep the crew busy all afternoon.

WORK CHART 27.—*Irrigated alfalfa stacked with push rakes and stacker (Kansas).*

[This method is adapted to 160 acres.]

Operation	Men	Teams	Time required													
			6	7	8	9	10	11	12	1	2	3	4	5	6	7	8
Mowing.....	A	a	m	m m	m m	m m	m m	m m	m	m	m m	m m	m m	m m	m m	m	
Raking.....	B	b					r	r r	r	r	r r	r r	r r	r r	r r	r	
Push raking.....	C	c								p	p p	p p	p p	p p	p p	p	
Push raking.....	D	d								p	p p	p p	p p	p p	p p	p	
Stacking.....	E	e								s	s s	s s	s s	s s	s s	s	
Stacking.....	F									s	s s	s s	s s	s s	s s	s	
Stacking.....	G									s	s s	s s	s s	s s	s s	s	

Seven men and 10 horses put up 16 tons (16 acres) per day. Yield, 1 ton per acre. Man-hours 3.15, team-hours 2.40 per ton. Labor cost, $1.10 per ton.

METHOD 28.

This crew can handle as much as 250 acres of alfalfa per cutting. As it does not start to work until 8 o'clock, or when the dew is almost gone, it is necessary to use three 5-foot mowers to cut down 25 acres per day. Only one rake being used, there is no time for gleaning. One man on the stack has to take care of hay from two sweep rakes, and is worked rather hard, especially when the weather is very warm. This method is in common use in western Kansas.

WORK CHART 28.—*Alfalfa stacked with push rakes and stacker (Western Kansas).*

[This method is adapted to 250 acres.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a			m	m	m	m	m	m	m	m	m	m	m
Mowing.....	B	b			m	m	m	m	m	m	m	m	m	m	m
Mowing.....	C	c			m	m	m	m	m	m	m	m	m	m	m
Raking.....	D	d			r	r	r	r	r	r	r	r	r	r	r
Push raking.....	E	e			p	p	p	p	p	p	p	p	p	p	p
Push raking.....	F	f			p	p	p	p	p	p	p	p	p	p	p
Stacking.....	G	g			s	s	s	s	s	s	s	s	s	s	s
Stacking.....	H				s	s	s	s	s	s	s	s	s	s	s

Eight men and 14 horses put up 31.25 tons (25 acres) per day. Yield, 1.25 tons per acre. Man-hours 2.46, team-hours 2.14 per ton. Labor cost, $0.92 per ton.

METHOD 29.

This crew arrangement is in common use in Colorado, where on account of there being no need to wait for dew to disappear, the crew starts at 7 a. m. The hay is raked with a side-delivery rake. Sometimes two men are used on the stack instead of one, as shown here.

WORK CHART 29.—*Irrigated alfalfa stacked with push rakes and stacker (Colorado).*

[This method is adapted to 300 acres.]

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6
Mowing.....	A	a	m m m m m m m m m m m m
Mowing.....	B	b	m m m m m m m m m m m m
Raking.....	C	c	r r r r r r r r r r r r
Push raking.....	D	d	p p p p p p p p p p p p
Push raking.....	E	e	p p p p p p p p p p p p
Push raking.....	F	f	p p p p p p p p p p p p
Stacking.....	G	g	s s s s s s s s s s s s
Stacking.....	H		s s s s s s s s s s s s

Eight men and 14 horses put up 30 acres (30 tons) per day. Yield, 1 ton per acre. Man-hours 2.66, team-hours 2.33 per ton. Labor cost, $0.998 per ton.

METHODS 30 AND 31.

Method 30 is given in order to show the high cost due to poor method. The hay is raked the second day with side-delivery rake. The third day two sweep rakes bring it from the windrow and dump it close to the stack site. The fourth day it is picked up by two other sweep rakes and stacked. Thus every day there are four sweeps in use, two dumping near the next stack site, and two picking up the bunches brought up the day before.

Method 31 is a rearrangement of method 30. The hay is delivered direct to stacker and not dumped on the ground. This reduces the crew from 9 men and 16 horses to 7 men and 12 horses, and lowers the cost 36 cents per ton.

WORK CHART 30.—*Irrigated alfalfa stacked with push rakes and stacker (Colorado).*

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6
Mowing.....	A	a	m m m m m m m m m m m m
Mowing.....	B	b	m m m m m m m m m m m m
Raking.....	C	c	r r r r r r r r r r r r
Push raking.....	D	d	p p p p p p p p p p p p
Push raking.....	E	e	p p p p p p p p p p p p
Push raking.....	F	f	p p p p p p p p p p p p
Push raking.....	G	g	p p p p p p p p p p p p
Staking.....	H	h	s s s s s s s s s s s s
Stacking.....	I		s s s s s s s s s s s s

Nine men and 16 horses put up 20 tons (20 acres) per day. Yield, 1 ton per acre. Man-hours 4.05, team-hours 3.60 per ton. Labor cost, $1.53 per ton.

WORK CHART 31.—*Irrigated alfalfa stacked with push rakes and stacker (Colorado).*

[This method is adapted to 200 acres.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a			m m	m m	m m	m m	m	m m	m m	m m	m m	m m	m
Mowing.....	B	b			m m	m m	m m	m m	m	m m	m m	m m	m m	m m	m
Raking.....	C	c			r r	r r	r r	r r	r	r r	r r	r r	r r	r r	r
Push raking.....	D	d			p p	p p	p p	p p	p	p p	p p	p p	p p	p p	p
Push raking.....	E	e			p p	p p	p p	p p	p	p p	p p	p p	p p	p p	p
Stacking.....	F	f			s s	s s	s s	s s	s	s s	s s	s s	s s	s s	s
Stacking.....	G				s s	s s	s s	s s	s	s s	s s	s s	s s	s s	s

Seven men and 12 horses put up 20 tons (20 acres) per day. Yield, 1 ton per acre. Man-hours 3.15, team-hours 2.70 per ton. Labor cost, $1.17 per ton.

METHOD 32.

Method 32 is well adapted to an area of 300 acres of irrigated alfalfa. Three 5-foot mowers are used, each cutting 10 acres per day. The close spacing of irrigation ditches in some cases makes it necessary to use more mowers than in others. The sulky rake is used for gleaning, and the side-delivery rake for raking into the windrows.

WORK CHART 32.—*Irrigated alfalfa stacked with push rakes and stacker (Colorado).*

[This method is adapted to 300 acres.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a		m m	m m	m m	m m	m m	m	m m	m m	m m	m m	m m	m
Mowing.....	B	b		m m	m m	m m	m m	m m	m	m m	m m	m m	m m	m m	m
Mowing.....	C	c		m m	m m	m m	m m	m m	m	m m	m m	m m	m m	m m	m
Raking.....	D	d		r r	r r	r r	r r	r r	r	r r	r r	r r	r r	r r	r
Push raking.....	E	e		p p	p p	p p	p p	p p	p	p p	p p	p p	p p	p p	p
Push raking.....	F	f		p p	p p	p p	p p	p p	p	p p	p p	p p	p p	p p	p
Push raking.....	G	g		p p	p p	p p	p p	p p	p	p p	p p	p p	p p	p p	p
Stacking.....	[1] H	h		s s	s s	s s	s s	s s	s	s s	s s	s s	s s	s s	s
Stacking.....	I			s s	s s	s s	s s	s s	s	s s	s s	s s	s s	s s	s
Stacking.....	J			s s	s s	s s	s s	s s	s	s s	s s	s s	s s	s s	s
Raking (gleaning).....	K	1		r r	r r	r r	r r	r r	r	r r	r r	r r	r r	r r	r

[1] Boy driving team on stacker.

Ten men, 1 boy, and 18 horses put up 37.5 tons (30 acres) per day. Yield, 1.25 tons per acre. Man-hours 2.80, team-hours 2.40 per ton. Labor cost, $1.04 per ton.

METHOD 33.

This crew, used in Nebraska, makes more than 500 acres of prairie hay in a season. The yield being only 1 ton to the acre, it is necessary to use three mowers in order to cut sufficient hay to keep the stacking crew of two men busy. It is sometimes necessary to add two men to this crew, one to drive the team on the stacker and the other to help on the stack. Where large acreages are put up, it is the rule in some sections to have one man on the stack for every sweep rake, which increases somewhat the cost per ton.

WORK CHART 33.—*Prairie hay stacked with push rakes and stacker (Nebraska).*

[This method is adapted to over 500 acres.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6	7
Mowing.....	A	a		m	m	m	m	m	m	m	m	m	m	m	m	m
Mowing.....	B	b		m	m	m	m	m	m	m	m	m	m	m	m	m
Mowing.....	C	c		m	m	m	m	m	m	m	m	m	m	m	m	m
Raking.....	D	d		r	r	r	r	r	r	r	r	r	r	r	r	r
Raking.....	E	e		r	r	r	r	r	r	r	r	r	r	r	r	r
Push raking.....	F	f		p	p	p	p	p	p	p	p	p	p	p	p	p
Push raking.....	G	g		p	p	p	p	p	p	p	p	p	p	p	p	p
Push raking.....	H	h		p	p	p	p	p	p	p	p	p	p	p	p	p
Stacking.....	I	i		s	s	s	s	s	s	s	s	s	s	s	s	s
Stacking.....	J			s	s	s	s	s	s	s	s	s	s	s	s	s

Ten men and 18 horses put up 45 tons (45 acres) per day. Yield, 1 ton per acre. Man-hours 2.22, team-hours 2 per ton. Labor cost, $0.84 per ton.

METHOD 34.

This method is adaptable to an area of 300 acres of timothy and clover. In order to cut 30 acres with two mowers in 10 hours, it is necessary to use 6-foot or 7-foot mowers when using the ordinary team. If 5-foot mowers are used, it will be necessary to use three of them, which will increase the cost per ton by about 8 cents. The rakes not only rake the 30 acres over once, but go over the windrows and glean the hay left by the sweep rake. (See No. 35, in which 3 mowers are used.) Twenty tons per sweep rake per day is a big day's work and represents about the maximum amount that can be handled even with a yield of 1⅓ tons per acre. Three sweeps usually are needed to handle 40 tons per day.

WORK CHART 34.—*Timothy and clover stacked with push rakes and stacker (Iowa).*

[This method is adapted to 300 acres.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a		m	m	m	m	m	m	m		m	m	m	m	m	m	m	m
Mowing.....	B	b		m	m	m	m	m	m	m		m	m	m	m	m	m	m	m
Raking.....	C	c		r	r	r	r	r	r	r		r	r	r	r	r	r	r	r
Raking.....	D	d		r	r	r	r	r	r	r		r	r	r	r	r	r	r	r
Push raking.....	E	e		p	p	p	p	p	p	p		p	p	p	p	p	p	p	p
Push raking.....	F	f		p	p	p	p	p	p	p		p	p	p	p	p	p	p	p
Stacking.....	G	g		s	s	s	s	s	s	s		s	s	s	s	s	s	s	s
Stacking.....	H			s	s	s	s	s	s	s		s	s	s	s	s	s	s	s
Stacking.....	I			s	s	s	s	s	s	s		s	s	s	s	s	s	s	s
Stacking.....	J			s	s	s	s	s	s	s		s	s	s	s	s	s	s	s

Ten men and 14 horses put up 40 tons (30 acres) per day. Yield per acre, 1.33 tons. Man-hours 2.50, team-hours 1.75 per ton. Labor cost, per ton, $0.85.

METHOD 35.

This arrangement is the same as method 34, except that one more mower is used, the mower in this case being 5-foot instead of the 6-foot or 7-foot mower used in method 34.

WORK CHART 35.—*Timothy and clover stacked with push rake and stacker (Iowa).*

[This method is adapted to 300 acres.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a		m	m	m	m	m	m	m		m	m	m	m	m	m	m	m
Mowing.....	B	b		m	m	m	m	m	m	m		m	m	m	m	m	m	m	m
Mowing.....	C	c		m	m	m	m	m	m	m		m	m	m	m	m	m	m	m
Raking.....	D	d		r	r	r	r	r	r	r		r	r	r	r	r	r	r	r
Raking.....	E	e		r	r	r	r	r	r	r		r	r	r	r	r	r	r	r
Push raking.....	F	f		p	p	p	p	p	p	p		p	p	p	p	p	p	p	p
Push raking.....	G	g		p	p	p	p	p	p	p		p	p	p	p	p	p	p	p
Stacking.....	H	h		s	s	s	s	s	s	s		s	s	s	s	s	s	s	s
Stacking.....	I			s	s	s	s	s	s	s		s	s	s	s	s	s	s	s
Stacking.....	J			s	s	s	s	s	s	s		s	s	s	s	s	s	s	s
Stacking.....	K			s	s	s	s	s	s	s		s	s	s	s	s	s	s	s

Eleven men and 16 horses put up 40 tons (30 acres) per day. Yield, 1.33 tons per acre. Man-hours 2.75, team-hours 2 per ton. Labor cost, $0.95 per ton.

Methods 36 and 37.

Method 36 is used on a 100,000-acre ranch in Oklahoma, where 2,000 acres of prairie hay are made each year. The work chart is for but one of several crews used. The cost per ton is higher than the average, because with several units working there is no incentive for the men to "speed up." The average amount handled per sweep is

Fig. 11.—A large stacking crew at work in the West. Four push rakes (not all shown in the picture) are waiting to unload. The loss of time waiting to unload increases the cost of stacking. This loss of time can be avoided by proper management of the push-rake crew.

less than 8 tons per day. Quite often, where a large number of men are working under a foreman, it will be found that the labor cost is higher than for a smaller crew, or a crew where the farmer himself works as one of the crew. (See fig. 11.)

Method 37 is almost identical with method 36, having the same number of horses but one more man. This crew puts up 3 less tons per day than No. 36, and is not a fast-working crew.

WORK CHART 36.—*Prairie hay stacked with push rakes and stacker (Oklahoma).*

[This crew stacked about 1,000 acres per year.]

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6
Mowing.....	A	a	m m m m m m m m m m m m m
Mowing.....	B	b	m m m m m m m m m m m m m
Mowing.....	C	c	m m m m m m m m m m m m m
Raking.....	D	d	r r r r r r r r r r r r r
Raking.....	E	e	r r r r r r r r r r r r r
Push raking.....	F	f	p p p p p p p p p p p p p
Push raking.....	G	g	p p p p p p p p p p p p p
Push raking.....	H	h	p p p p p p p p p p p p p
Push raking.....	I	i	p p p p p p p p p p p p p
Stacking.....	J	j	s s s s s s s s s s s s s
Stacking.....	K		s s s s s s s s s s s s s
Stacking.....	L		s s s s s s s s s s s s s
Stacking.....	M		s s s s s s s s s s s s s

Thirteen men and 20 horses put up 36 tons (36 acres) per day. Yield, 1 ton per acre. Man-hours 3.61, team-hours 2.77 per ton. Labor cost, $1.276 per ton.

WORK CHART 37.—*Alfalfa stacked with push rakes and stacker (Oklahoma).*

[This method is adapted to 300 acres.]

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6
Mowing.....	A	a	m m m m m m m m m m m m m
Mowing.....	B	b	m m m m m m m m m m m m m
Mowing.....	C	c	m m m m m m m m m m m m m
Raking.....	D	d	r r r r r r r r r r r r r
Raking.....	E	e	r r r r r r r r r r r r r
Push raking.....	F	f	p p p p p p p p p p p p p
Push raking.....	G	g	p p p p p p p p p p p p p
Push raking.....	H	h	p p p p p p p p p p p p p
Push raking.....	I	i	p p p p p p p p p p p p p
Stacking.....	J	j	s s s s s s s s s s s s s
Stacking.....	K		s s s s s s s s s s s s s
Stacking.....	L		s s s s s s s s s s s s s
Stacking.....	M		s s s s s s s s s s s s s
Stacking.....	N		s s s s s s s s s s s s s

Fourteen men and 20 horses put up 33 tons (33 acres) per day. Yield, 1 ton per acre. Man-hours 4.16, team-hours 2.96 per ton. Labor cost, $1.424 per ton.

METHOD 38.

This large crew is very efficient and makes over 1,000 acres of prairie hay each year. Each member of the crew puts in a full day every day. The cost per ton is low, because men and horses are well used to the work and there is no lost time. One more man is used on the stack than is customary when only three sweep rakes are used. This crew will put up 450 acres of tame hay in a 10-day season. The field is raked twice.

WORK CHART 38.—*Prairie hay stacked with push rakes and stacker (Nebraska).*

[This method is adapted to 1,000 acres or more of prairie hay or 450 acres of tame hay.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a		m	m	m	m	m	m	m		m	m	m	m	m	m
Mowing.....	B	b		m	m	m	m	m	m	m		m	m	m	m	m	m
Mowing.....	C	c		m	m	m	m	m	m	m		m	m	m	m	m	m
Raking.....	D	d		r	r	r	r	r	r	r		r	r	r	r	r	r
Raking.....	E	e		r	r	r	r	r	r	r		r	r	r	r	r	r
Raking.....	F	f		r	r	r	r	r	r	r		r	r	r	r	r	r
Push raking.....	G	g		p	p	p	p	p	p	p		p	p	p	p	p	p
Push raking.....	H	h		p	p	p	p	p	p	p		p	p	p	p	p	p
Push raking.....	I	i		p	p	p	p	p	p	p		p	p	p	p	p	p
Stacking.....	J	j		s	s	s	s	s	s	s		s	s	s	s	s	s
Stacking.....	K			s	s	s	s	s	s	s		s	s	s	s	s	s
Stacking.....	L			s	s	s	s	s	s	s		s	s	s	s	s	s
Stacking.....	M			s	s	s	s	s	s	s		s	s	s	s	s	s
Stacking.....	N			s	s	s	s	s	s	s		s	s	s	s	s	s

Fourteen men and 20 horses put up 67.5 tons (45 acres) per day. Yield, 1.5 tons per acre. Man-hours 2, team-hours 1.48 per ton. Labor cost, per ton, $0.696.

METHOD 39.

The labor cost per ton for this method is high, $1.55 per ton. This is not due to poor crew management, but to the low yield per acre (only half a ton), necessitating twice the number of mowers and rakes to harvest a given amount of hay as would be required for a yield of 1 ton per acre. It will be noticed that while a sweep rake handled 12 tons per day, it must cover 24 acres to get this amount. To cover this area, a sweep must be kept on the jump every minute. This crew puts up 4,000 tons of prairie hay in Colorado.

WORK CHART 39.—*Prairie hay stacked with push rakes and stacker (Colorado).*

[This method is adapted to a large acreage.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a		m m m m m m m m m m						m m m m m m m m m m					
Mowing.....	B	b		m m m m m m m m m m						m m m m m m m m m m					
Mowing.....	C	c		m m m m m m m m m m						m m m m m m m m m m					
Mowing.....	D	d		m m m m m m m m m m						m m m m m m m m m m					
Mowing.....	E	e		m m m m m m m m m m						m m m m m m m m m m					
Mowing.....	F	f		m m m m m m m m m m						m m m m m m m m m m					
Raking.....	G	g		r r r r r r r r r r						r r r r r r r r r r					
Raking.....	H	h		r r r r r r r r r r						r r r r r r r r r r					
Raking.....	I	i		r r r r r r r r r r						r r r r r r r r r r					
Push raking.....	J	j		p p p p p p p p p p						p p p p p p p p p p					
Push raking.....	K	k		p p p p p p p p p p						p p p p p p p p p p					
Push raking.....	L	l		p p p p p p p p p p						p p p p p p p p p p					
Stacking.....	M	m		s s s s s s s s s s						s s s s s s s s s s					
Stacking.....	N			s s s s s s s s s s						s s s s s s s s s s					
Stacking.....	O			s s s s s s s s s s						s s s s s s s s s s					

Fifteen men and 26 horses put up 36 tons (72 acres) per day. Yield, 0.5 ton per acre. Man-hours 4.16, team-hours 3.61 per ton. Labor cost, $1.55 per ton.

System 4.—Baling from the Windrow.

The cheapest method of getting hay into the bale is to bale it directly from the windrow, using the sweep rake to bring it to the press. There is only one serious objection to this practice, and that is the danger of the hay not being dry enough to keep. This objection holds in the East and South, but not in the West.

In the prairie hay section of the Middle West it is customary to bale from the windrow, especially if the hay is to be shipped to market. The saving entailed by not stacking includes getting the hay upon the stack, stacking, and pitching from stack to the press. As the prairie haying season lasts for several weeks there, a small crew with a two-horse press will often bale over 600 tons per season. A power press will bale about twice as much as a horse press.

A two-horse press will bale from 6 to 15 tons of hay per day, the average probably being about 8 tons, although many crews will bale 10 tons per day.

The press crew requires from 3 to 5 men, and if the team requires it, a boy will be needed to drive. The crew ordinarily is arranged as follows: One or two pitchers, one pressman, one wirer, one driver

(usually a boy). If a "patent" whip is used, the team on the press requires no driver. If the hay yields 1 ton per acre, one mower will be kept busy all day. One straight-tooth rake will be kept busy half a day, unless the operator rerakes, in which event it will be busy all day. One push rake will be required. With a yield of one-half ton per acre, two mowers will be required to cut enough down to keep the press busy, and the rake will only be able to rake the field over once.

When hay is baled in the field with a power press, the crew will vary from 8 to 16 or more men, and the number of horses used will be from 6 to 12 or more. Most power presses in the alfalfa and prairie hay regions are owned on farms having over 500 tons to bale per year, or by men who make custom baling their business. As a rule, a power press will bale from 500 to 3,000 tons per year, and in such cases the press and field crew get used to making and baling day after day and soon become proficient.

The seasonal repairs on power presses operated by inexperienced men may amount to several times as much as those on a press operated by skilled pressmen. The methods illustrated are those in common practice in the alfalfa and prairie hay sections.

Method 40.

A common arrangement for small crews. This crew bales but 6 tons per day, the low output being largely due to the fact that only one horse is used on the press. One horse is not able to keep a press running at its maximum capacity all day. The hay field is raked twice, which also slightly increases the cost per ton.

Work Chart 40.—*Prairie hay baled from the windrow with horse press.*

[This crew bales 90 tons per year.]

Operation	Men	Teams	Time required											
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a		m	m	m	m	m	m	m	m	m	m	m	m
Raking.....	B	b		r	r	r	r	r	r	r	r	r	r	r	r
Push raking.....	C	c		p	p	p	p	p	p	p	p	p	p	p	p
Press crew:															
Pitching.....	D			p	p	p	p	p	p	p	p	p	p	p	p
Feeding.....	E			f	f	f	f	f	f	f	f	f	f	f	f
Wiring.....	F			w	w	w	w	w	w	w	w	w	w	w	w
Driving.....		d		d	d	d	d	d	d	d	d	d	d	d	d

Six men and 7 horses bale 6 tons (12 acres) per day. Yield, 0.50 ton per acre. Man-hours 10, horse-hours 11.66 per ton. Labor cost, $3.16 per ton. Cost of labor and wire, $3.41 per ton.

METHOD 41.

This crew is composed of 6 men, only three men being used at the press—1 to feed, 1 to pitch, and 1 to wire the bales. The mower cuts 10 acres in 7½ hours. The pitcher works much harder than when 4 men are used at the press, and it is customary for the three men at the press to change places frequently to lighten the work on the pitcher. This crew will bale 600 tons of prairie hay per season.

WORK CHART 41.—*Prairie hay baled from the windrow with horse press (Oklahoma).*

[This crew bales 600 tons per year.]

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a					m m	m m	m		m m	m m	m m	m m	m
Raking.....	B	b									r r	r r	r r	r r	r
Push raking.....	C	c		p p	p p	p p	p p	p p	p		p p	p p	p p	p p	p
Press crew:															
Pitching.....	D			p p	p p	p p	p p	p p	p		p p	p p	p p	p p	p
Feeding.....	E			f f	f f	f f	f f	f f	f		f f	f f	f f	f f	f
Wiring.....	F			w w	w w	w w	w w	w w	w		w w	w w	w w	w w	w
Driving.....		d		d d	d d	d d	d d	d d	d		d d	d d	d d	d d	d

Six men and 8 horses bale 10 tons (10 acres) per day. Yield, 1 ton per acre. Man-hours 6, team-hours 4 per ton. Labor cost, $2 per ton. Cost of labor and wire, $2.20 per ton.

METHOD 42.

This method is used by a crew which makes a business of custom baling and works throughout the haying season pressing prairie hay. The mower is kept busy all day, and the sulky rake half a day. Four men work at the press, and with a yield of 1 ton per acre, 10 tons are baled each day. The rake team and driver are idle half a day, but can be used to help haul the baled hay to warehouse or car at shipping point.

This type of crew is very common in Oklahoma and other parts of the Middle West.

WORK CHART 42.—*Prairie hay baled from the windrow with horse press (Oklahoma).*

[This crew is operated by a man who makes a business of baling for others.]

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6
Mowing	A	a	m m m m m m m m m m m m m m m m m m m m m m m m
Raking	B	b	r r r r r r r r r r r r
Push raking	C	c	p p p p p p p p p p p p p p p p p p p p p p p p
Press crew:			
Pitching	D		p p p p p p p p p p p p p p p p p p p p p p p p
Feeding	E		f f f f f f f f f f f f f f f f f f f f f f f f
Wiring	F		w w w w w w w w w w w w w w w w w w w w w w w w
Driving	G	d	d d d d d d d d d d d d d d d d d d d d d d d d

Seven men and 8 horses bale 10 tons (10 acres) per day. Yield, 1 ton per acre. Man-hours 6.50, team-hours 3.50 per ton. Labor cost, $2 per ton. Cost of labor and wire, $2.25 per ton.

METHOD 43.

This method shows an arrangement of labor commonly used in the prairie-hay section of the Middle West. The size of the press crew is such that the men need not work overly hard. The 10 tons baled per day is a good day's work for a 2-horse press. The only objection to this method is that the rake is busy only half of the time. If the field were reraked, enough hay would be gleaned to more than pay for the labor cost of doing it.

WORK CHART 43.—*Prairie hay baled from the windrow with horse press.*

[This crew bales 320 tons per year.]

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6
Mowing	A	a	m m m m m m m m m m m m m m m m m m m m m m m m
Raking	B	b	r r r r r r r r r r r r
Push raking	C	c	p p p p p p p p p p p p p p p p p p p p p p p p
Press crew:			
Pitching	D		p p p p p p p p p p p p p p p p p p p p p p p p
Pitching	E		p p p p p p p p p p p p p p p p p p p p p p p p
Feeding	F		f f f f f f f f f f f f f f f f f f f f f f f f
Wiring	G		w w w w w w w w w w w w w w w w w w w w w w w w
Driving		d	d d d d d d d d d d d d d d d d d d d d d d d d

Seven men and 8 horses bale 10 tons (10 acres) per day. Yield, 1 ton per acre. Man-hours 6.50, team-hours 3.50 per ton. Labor cost, $2 per ton. Cost of labor and wire, $2.25 per ton.

METHOD 44.

This crew uses only three men at the press, the press team needing no driver. The yield being only one-half ton per acre, it is necessary to use two mowers and the sulky rake all day. This is a common arrangement in the prairie-hay sections of Oklahoma and Arkansas.

WORK CHART 44.—*Prairie hay baled from the windrow with horse press (Arkansas).*

Operation	Men	Teams	Time required												
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a		m m m m m m m m m m						m m m m m m m m m m					
Mowing.....	B	b		m m m m m m m m m m						m m m m m m m m m m					
Raking.....	C	c		r r r r r r r r r r						r r r r r r r r r r					
Push raking.....	D	d		p p p p p p p p p p						p p p p p p p p p p					
Press crew:															
Pitching.....	E			p p p p p p p p p p						p p p p p p p p p p					
Feeding.....	F			f f f f f f f f f f						f f f f f f f f f f					
Wiring.....	G			w w w w w w w w w w						w w w w w w w w w w					
Driving.....		e		d d d d d d d d d d						d d d d d d d d d d					

Seven men and 10 horses bale 10 tons (20 acres) per day. Yield, 0.50 ton per acre. Man-hours 7, team-hours 5 per ton. Labor cost, $2.40 per ton. Cost of labor and wire, $2.65 per ton.

METHOD 45.

This method is used in Oklahoma by a farmer who presses but 50 to 75 tons of hay per year. The daily output is a little below the average, and no doubt the slow performance of the crew is due to the fact that the men are not experienced haymakers and pressers, and that there is no incentive to "speed up," since the acreage is small.

WORK CHART 45.—*Prairie hay baled from the windrow with horse press (Oklahoma).*

[This crew bales 45 tons per year.]

Operation	Men	Teams	Time required											
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a		m m	m m	m m	m m	m m	m	m m	m m	m m	m m	m	
Raking.....	B	b								r r	r r	r r	r r	r r	r
Push raking.....	C	c		p p	p p	p p	p p	p p	p	p p	p p	p p	p p	p p	p
Press crew:															
Pitching.....	D			p p	p p	p p	p p	p p	p	p p	p p	p p	p p	p p	p
Pitching.....	E			p p	p p	p p	p p	p p	p	p p	p p	p p	p p	p p	p
Feeding.....	F			f f	f f	f f	f f	f f	f	f f	f f	f f	f f	f f	f
Wiring.....	G			w w	w w	w w	w w	w w	w	w w	w w	w w	w w	w w	w
Driving.....	H	d		d d	d d	d d	d d	d d	d	d d	d d	d d	d d	d d	d

Eight men and 8 horses bale 7.50 tons (6 acres) per day. Yield, 1.25 tons per acre. Man-hours 9.73, team-hours 4.40 per ton. Labor cost, per ton, $2.82. Cost of labor and wire, $3.07 per ton.

METHOD 46.

Work chart 46 shows the labor distribution of a crew used for custom-baling in Oklahoma. Very often it will be found that crews

FIG. 12.—Baling alfalfa, cured in the cock, with a two-horse press. More men are used in the baling crew than is necessary. Large press crews make the work per man easy, but increases greatly the cost per ton of baling.

making a business of baling hay throughout the season include one more man than in the case of the owner who bales only his own hay, or, at most, a small quantity. The added cost over that of method 44 is caused by the extra man in the press crew. (See fig. 12.)

WORK CHART 46.—*Prairie hay baled from the windrow with horse press (Oklahoma).*

[This crew is operated by a custom baler.]

Operation	Men	Teams	Time required: 6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing	A	a		m	m	m	m	m	m	m	m	m	m	m	m	m	m
Mowing	B	b		m	m	m	m	m	m	m	m	m	m	m	m	m	m
Raking	C	c		r	r	r	r	r	r	r	r	r	r	r	r	r	r
Push raking	D	d		p	p	p	p	p	p	p	p	p	p	p	p	p	p
Press crew:																	
Pitching	E			p	p	p	p	p	p	p	p	p	p	p	p	p	p
Feeding	F			f	f	f	f	f	f	f	f	f	f	f	f	f	f
Wiring	G			w	w	w	w	w	w	w	w	w	w	w	w	w	w
Driving	H	e		d	d	d	d	d	d	d	d	d	d	d	d	d	d

Eight men and 10 horses bale 10 tons (20 acres) per day. Yield, 0.50 ton per acre. Man-hours 8, team-hours 5 per ton. Labor cost, $2.60 per ton. Cost of labor and wire, $2.85 per ton.

METHOD 47.

This crew, with a yield of 1½ tons of Johnson grass hay per acre, will bale 15 tons of hay per day of 11 hours, if a good day's run is made. This record is high for a crew of this size, but with a "three-stroke" press and everybody working hard, it is possible to bale out 15 tons. It is customary, with this output, to change teams on the press. A driver, a boy, handles the press team, which insures keeping the press going at its maximum speed.

WORK CHART 47.—*Johnson grass baled from the windrow with horse press (Texas).*

Operation	Men	Teams	Time required: 6	7	8	9	10	11	12	1	2	3	4	5	6	7
Mowing	A	a		m	m	m	m	m	m	m	m	m	m	m	m	m	m
Raking	B	b		r	r	r	r	r	r	r	r	r	r	r	r	r	r
Push raking	C	c		p	p	p	p	p	p	p	p	p	p	p	p	p	p
Press crew:																	
Pitching	D			p	p	p	p	p	p	p	p	p	p	p	p	p	p
Pitching	E			p	p	p	p	p	p	p	p	p	p	p	p	p	p
Feeding	F			f	f	f	f	f	f	f	f	f	f	f	f	f	f
Wiring	G			w	w	w	w	w	w	w	w	w	w	w	w	w	w
Driving	H	d		d	d	d	d	d	d	d	d	d	d	d	d	d	d

Seven men, 1 boy, and 8 horses bale 15 tons (12 acres) per day. Yield, 1.25 tons per acre. Man-hours 5.50, team-hours 2.93 per ton. Labor cost, $1.68 per ton. Labor cost and wire, $1.93 per ton.

METHOD 48.

This method shows a distribution of labor not often found. The greatest fault of this plan is the long hours worked by the mower. Thirteen hours makes a very long day for man or team. By using a different team in the afternoon, it is possible to cut 16 acres per day. Method 49 is a better arrangement with regard both to hours worked and to labor cost per ton.

WORK CHART 48.—*Prairie hay baled from the windrow with gasoline power press (Oklahoma).*

[This crew bales 300 tons per year.]

Operation	Men	Teams	Time required														
			6	7	8	9	10	11	12	1	2	3	4	5	6	7	8
Mowing.....	A	a	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
Raking.....	B	b		r	r	r	r	r	r	r	r	r	r	r	r		
Push raking.....	C	c		p	p	p	p	p	p	p	p	p	p	p	p	p	p
Press crew:																	
Pitching.....	D			p	p	p	p	p	p	p	p	p	p	p	p	p	p
Pitching.....	E			p	p	p	p	p	p	p	p	p	p	p	p	p	p
Feeding.....	F			f	f	f	f	f	f	f	f	f	f	f	f	f	f
Wiring.....	G			w	w	w	w	w	w	w	w	w	w	w	w	w	w
Wiring.....	H			w	w	w	w	w	w	w	w	w	w	w	w	w	w

Eight men and 6 horses bale 16 tons (16 acres) per day. Yield, 1 ton per acre. Man-hours 5.60, team-hours 2.13 per ton. Labor cost, $1.54 per ton. Cost of labor, gasoline, and wire, $1.94 per ton.

METHOD 49.

This method is almost identical with method 50. The only difference is that the rake starts 2 hours later than in the other method. Both methods are in common use in the prairie-hay section of the Middle West.

WORK CHART 49.—*Prairie hay baled from the windrow with gasoline power press (Oklahoma).*

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6
Mowing.....	A	a	m m m m m m m m m m m m
Mowing.....	B	b	m m m m m m m m m m m m
Raking.....	C	c	r r r r r r r r r r r r
Push raking.....	D	d	p p p p p p p p p p p p
Press crew:			
Pitching.....	E		p p p p p p p p p p p p
Pitching.....	F		p p p p p p p p p p p p
Feeding.....	G		f f f f f f f f f f f f
Wiring.....	H		w w w w w w w w w w w w

Eight men and 8 horses bale 18 tons (18 acres) per day. Yield, 1 ton per acre. Man-hours 4.60, team-hours 2.19 per ton. Labor cost, $1.36 per ton. Cost of labor, gasoline, and wire, $1.75 per ton.

METHOD 50.

This method shows the smallest possible crew for the operation of a power press baling 20 tons per day. This crew bales more than 1,000 tons of prairie hay per season. There is no lost or idle time. The crew works 11 hours per day. With this method, 5 men instead of 4 are used very often on the press crew, in order to make the work a little easier.

WORK CHART 50.—*Prairie hay baled from the windrow with gasoline power press (Kansas).*

[This crew bales over 1,000 tons per year.]

Operation	Men	Teams	Time required: 6 7 8 9 10 11 12 1 2 3 4 5 6 7
Mowing.....	A	a	m m m m m m m m m m m m
Mowing.....	B	b	m m m m m m m m m m m m
Raking.....	C	c	r r r r r r r r r r r r
Push raking.....	D	d	p p p p p p p p p p p p
Press crew:			
Pitching.....	E		p p p p p p p p p p p p
Pitching.....	F		p p p p p p p p p p p p
Feeding.....	G		f f f f f f f f f f f f
Wiring.....	H		w w w w w w w w w w w w

Eight men and 8 horses bale 20 tons (20 acres) per day. Yield, 1 ton per acre. Man-hours 4.40, team-hours 2.20 per ton. Labor cost, $1.32 per ton. Cost of labor, gasoline, and wire, $1.69 per ton.

METHOD 51.

This crew bales 5 tons more per day than the crew used in method 50. Twenty tons per day is about all a sweep rake will handle. In order to bale 5 more tons, it is necessary to use 2 sweep rakes and more men at the press. The press crew is kept very busy, but is not overworked, as a 4-man press crew would be. In this crew there is 1 engineer, 1 feeder, 2 pitchers, 2 wiremen, and 1 man to haul water and help about the press. This crew bales 1,800 tons per season.

WORK CHART 51.—*Prairie hay baled from the windrow with steam press.*

[This crew bales 1,800 tons per year.]

Operation	Men	Teams	Time required											
			6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a		m	m	m	m	m	m		m	m	m	m	m	m
Mowing.....	B	b		m	m	m	m	m	m		m	m	m	m	m	m
Raking.....	C	c		r	r	r	r	r	r		r	r	r	r	r	r
Push raking.....	D	d		p	p	p	p	p	p		p	p	p	p	p	p
Push raking.....	E	e		p	p	p	p	p	p		p	p	p	p	p	p
Press crew:															
Pitching.....	F			p	p	p	p	p	p		p	p	p	p	p	p
Pitching.....	G			p	p	p	p	p	p		p	p	p	p	p	p
Feeding.....	H			f	f	f	f	f	f		f	f	f	f	f	f
Wiring.....	I			w	w	w	w	w	w		w	w	w	w	w	w
Wiring.....	J			w	w	w	w	w	w		w	w	w	w	w	w
Engineer.....	K			e	e	e	e	e	e		e	e	e	e	e	e
Hauling water.	L	f		h	h	h	h	h	h		h	h	h	h	h	h

Twelve men and 12 horses bale 25 tons (25 acres) per day. Yield, 1 ton per acre. Man-hours 4.80, team-hours 2.40 per ton. Labor cost, $1.44 per ton. Total cost, including wire, $1.69 per ton.

METHOD 52.

This crew is used on an Oklahoma farm producing 450 acres of alfalfa. It will be necessary to use two 8-foot mowers to cut 35 acres per day. If 6-foot mowers are used, three will be required, which will increase the cost about 15 cents per ton. The two 11-foot side-delivery rakes not only rake 35 acres per day, but turn the windrows over the second day. The press crew is necessarily fairly large on account of the hay being heavy to handle and the weather hot. As no hay is bunched or cocked, the crew will lose some time mornings if there is a heavy dew.

WORK CHART 52.—*Alfalfa baled from the windrow with gasoline power press (Oklahoma).*

[This crew bales the hay from 450 acres per year.]

Operation	Men	Teams	Time required: 6	7	8	9	10	11	12	1	2	3	4	5	6
Mowing.....	A	a		m m	m m	m m	m m	m m	m	m m	m m	m m	m m	m m	m
Mowing.....	B	b		m m	m m	m m	m m	m m	m	m m	m m	m m	m m	m m	m
Raking.....	C	c		r r	r r	r r	r r	r r	r	r r	r r	r r	r r	r r	r
Raking.....	D	d		r r	r r	r r	r r	r r	r	r r	r r	r r	r r	r r	r
Push raking.....	E	e		p p	p p	p p	p p	p p	p	p p	p p	p p	p p	p p	p
Push raking.....	F	f		p p	p p	p p	p p	p p	p	p p	p p	p p	p p	p p	p
Press crew:															
Pitching.....	G			p p	p p	p p	p p	p p	p	p p	p p	p p	p p	p p	p
Pitching.....	H			p p	p p	p p	p p	p p	p	p p	p p	p p	p p	p p	p
Pitching.....	I			p p	p p	p p	p p	p p	p	p p	p p	p p	p p	p p	p
Feeding.....	J			f f	f f	f f	f f	f f	f	f f	f f	f f	f f	f f	f
Wiring.....	K			w w	w w	w w	w w	w w	w	w w	w w	w w	w w	w w	w
Wiring.....	L			w w	w w	w w	w w	w w	w	w w	w w	w w	w w	w w	w
Bearing away bales.....	M			b b	b b	b b	b b	b b	b	b b	b b	b b	b b	b b	b

Thirteen men and 12 horses bale 20 tons (35 acres) per day. Yield, 0.57 tons per acre. Man-hours 6.50, team-hours 3 per ton. Labor cost, $1.90 per ton. Cost of labor, gasoline, and wire (3 wires to the bale), $2.38 per ton.

METHOD 53.

This crew appears to compare unfavorably with others shown, judging by the relatively high cost per ton. The main reason for this higher cost is that the temperature is very high, making it

FIG. 13.—Bunching hay. The hay has been put into piles with a push rake. A hand fork is used to "round up" the piles. Enough hay is bunched every day to keep the baler busy in the morning until the dew is off the hay in the windrow. This practice enables the press crew to do a full day's work.

necessary to have almost a double press crew. There are 2 feeders and 4 pitchers. These are divided into two crews and work in 20-minute shifts. One man is kept busy all day bunching or cocking with a hand fork, so that hay will be ready to bale in the early morning before the dew is off of the hay in the swath and windrow. (See fig. 13.)

WORK CHART 53.—*Prarie hay baled from the windrow with gasoline power press (Oklahoma).*

[This crew bales over 2,000 tons per year.]

Operation	Men	Teams	Time required: 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8
Mowing	A	a	m m m m m m m m m m m m m m m m m m m m m m m m
Mowing	B	b	m m m m m m m m m m m m m m m m m m m m m m m m
Raking	C	c	r r r r r r r r r r r r r r r r r r r r r r r r
Raking	D	d	r r r r r r r r r r r r r r r r r r r r r r r r
Push raking	E	e	p p p p p p p p p p p p p p p p p p p p p p p p
Push raking	F	f	p p p p p p p p p p p p p p p p p p p p p p p p
Bunching	G		b b b b b b b b b b b b b b b b b b b b b b b b
Press crew:			
Pitching	H		p p p p p p p p p p p p p p p p p p p p p p p p
Pitching	I		p p p p p p p p p p p p p p p p p p p p p p p p
Pitching	J		p p p p p p p p p p p p p p p p p p p p p p p p
Pitching	K		p p p p p p p p p p p p p p p p p p p p p p p p
Feeding	L		f f f f f f f f f f f f f f f f f f f f f f f f
Feeding	M		f f f f f f f f f f f f f f f f f f f f f f f f
Wiring	N		w w w w w w w w w w w w w w w w w w w w w w w w
Wiring	O		w w w w w w w w w w w w w w w w w w w w w w w w
Bearing away bales	P		b b b b b b b b b b b b b b b b b b b b b b b b
Foreman[1]	Q		f f f f f f f f f f f f f f f f f f f f f f f f

[1] Helps feed, pitch, or do any other necessary work.

Seventeen men and 12 horses bale 35 tons (28 acres) per day. Man-hours 6.31, team-hours 2.22 per ton Labor cost, $1.70 per ton. Cost of labor, gasoline, and wire, $2.07 per ton.

CONCLUSION.

This study emphasizes the fact that many farmers make hay in a haphazard fashion, without any definite method adapted to individual conditions. This is especially true of the farmers of the East, where comparatively small acreages of hay are grown. In the States where large acreages are handled, necessity has brought home to the farmers the fact that failure to adopt a method suited to the crew available and to the acreage to be harvested may result in poor hay and an excessive labor cost. Hence, as a rule, it was found that the more efficient methods of handling hay were in vogue in the middle and western States.

It was found that small crews often were more efficient than very large ones. This was especially noticeable where the push rake was used. Five push rakes often will put into the stack as much hay as seven, since the latter, where the haul is short, will bring the hay in faster than it can be stacked.

Baling hay from the field was found to be the cheapest system of putting hay into the bale. It should be noted, however, that this system usually can be used to advantage only in regions where little or no rain falls during the haying season. Bunching enough hay in the afternoon to keep the baler busy an hour or two in the morning is a common practice among the more efficient crews studied. This obviates loss of time in the morning while the dew is drying from the hay in the swath or windrow. The total day's output of the baler often was found to be limited by the capacity of the mower rather than by that of the press. In the best practice care is taken to provide means for cutting enough hay to keep the presses running at full capacity.

Two reasons why the hay loader is not in more general use were given by the farmers visited, namely, the relatively large cash outlay entailed and the fact that handling hay on the wagon with a loader is very heavy work as compared with driving a push rake.

The detailed methods illustrated here are given merely as a basis of study, to help the hay grower in working out the method best adapted to his own conditions. The costs per ton for man and for horse labor are only relative, and while in the main perhaps approximately correct, at least as regards man labor, they are not intended to represent the actual cost of making hay in the several localities visited.

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